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CLINICAL AND SOCIAL PROBLEMS OF PEPTIC ULCER*

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These two lectures aim to give a perspective of peptic ulcer as it exists among the community and a commentary on clinical problems of diagnosis and management.

It is well known that the pattern of peptic ulcer has changed greatly in the past century. Acute gastric ulcers in young women were formerly the main cause of hospital admissions for haematemesis and melaena, or acute perforation, but to-day such patients are rarely seen. The frequency of true chronic gastric ulcer has probably altered little since 1920, but that of juxtapyloric (including duodenal) ulcers, affecting predominantly young and middle-aged men, had increased more than twofold in the twenty years between the two world wars (Illingworth, Scott, and Jamieson, 1944).

Has the prevalence of duodenal ulcer continued to increase since 1938? Evidence from the national mortality rates and hospital admissions for acute perforation suggest that this is so. The experience for acute perforations at the Central Middlesex Hospital, serving a population of 300,000 persons in North-west London, is recorded in Table I. Admissions for duodenal ulcer have increased, but there has been no increase and even a slight fall in admissions for perforated gastric ulcer, with consequent change in the G.U./D.U. ratio.

TABLE I.—*Acute Perforations*

Years of Admission	G.U.	D.U.	G.U.: D.U. Ratio
Male			
1938–40	21	77	1: 3·7
1941–3	27	81	1: 3·0
1944–6	29	102	1: 3·5
1947–9	26	142	1: 5·4
1950–2	21	177	1: 8·4
1953–5	15	134	1: 8·9
	139	713	
Female			
1938–43	11	10	1: 0·91
1944–9	12	15	1: 1·25
1950–5	18	39	1: 2·17
	41	64	

It is probable that this experience in North-west London reflects the national trend, for it fits in with the 1938–48 survey of perforations admitted to 40 British hospitals (Avery Jones, 1955b) and also with the continuing experience at Glasgow (Jamieson, 1955).

When the Registrar-General's figures for peptic ulcer are examined it will be found that for some years there has been little change in the total number of deaths from peptic ulcer in Great Britain, but these figures may be misleading and must be interpreted separately for patients over and under the age of 65. Above this age, deaths from both gastric and duodenal ulcer have increased, but since 1948 there has been a drop in the death rate attributed to senility and it is possible that the apparent increase in mortality from peptic ulcer in the elderly reflects a greater precision in diagnosis. Under 65, the mortality of gastric and duodenal ulcer must be considered separately. Deaths from gastric ulcer have decreased. The risk to life from the complications of peptic ulcer has diminished greatly since the introduction of antibiotics and relaxant anaesthetics, and this is the most likely explanation for this fall in mortality. The death rate from duodenal ulcer in those under 65 has remained almost unchanged. This is very surprising in view of the known improvement in treatment, and it raises the possibility that the apparently stationary mortality for duodenal ulcer may be hiding an increasing prevalence. These trends, noted by Doll (1952) up to 1948, have continued since then (Table II).

A continuing rise in incidence of peptic ulcer has also been reported elsewhere. In Denmark, Alsted (1953)

TABLE II.—*Deaths Per Million Living (To Nearest Whole Number*

Age in Years	1949	1950	1951	1952	1953
Duodenal Ulcer Male					
15–24	4	4	7	6	2
25–34	17	17	16	16	13
35–44	53	49	58	48	36
45–54	135	132	140	126	111
55–64	228	233	256	239	241
65+	328	380	508	504	492
Duodenal Ulcer Female					
15–24	1	0 (0·4)	1	1	0 (0·4)
25–34	2	2	2	2	2
35–44	5	6	7	6	4
45–54	14	14	15	15	13
55–64	28	33	31	32	30
65+	61	77	98	90	103
Gastric Ulcer Male					
15–24	4	3	3	3	1
25–34	10	9	9	5	6
35–44	44	43	33	30	22
45–54	147	110	126	105	92
55–64	295	286	272	239	211
65+	440	507	547	543	523
Gastric Ulcer Female					
15–24	2	1	0 (0·3)	1	0 (0·4)
25–34	2	3	3	2	3
35–44	9	9	7	9	7
45–54	26	22	22	24	20
55–64	68	66	63	55	52
65+	184	204	232	226	222

*The first of two Lumleian Lectures delivered before the Royal College of Physicians of London on April 10 and 12, 1956.

found peptic ulcer more than doubled in Denmark between 1940 and 1948. In Stockholm, Tomenius (1955) recorded almost a 50% increase between 1938 and 1952.

Present Prevalence

What is the present prevalence of peptic ulcer in this country, and what is its economic importance? With these questions in mind several studies were organized.

One of the problems in medical practice is to get a complete view of any medical problem. The consultant at the hospital and the general practitioner tend to see two different groups, for the severe cases are concentrated in hospital practice. An unbiased overall view was obtained from a survey of 6,047 members of the public, done in collaboration with Dr. Richard Doll and the assistance of a research almoner, Miss M. M. Buckatzsch (Doll, Jones, and Buckatzsch, 1951). In men, the incidence of peptic ulcer (active and inactive) was found to rise to a maximum little short of 10% in the age group 45–54. In women, the highest incidence was 6%, and was not found until the age of 55. The incidence in the older age groups of women reflects partly the prevalence of acute gastric ulcers among girls at the beginning of the century.

An impressive incidence may be demonstrated, but such large absolute figures do not indicate the degree of suffering and disability. Of the total number of persons with diagnosed ulcers in the survey—those who have had definite ulcer-like symptoms or complications of ulcer—approximately a quarter had had an episode of dyspepsia followed by some years of freedom from dyspepsia, or with perhaps only slight symptoms; in rather more than a half there were recurrent symptoms at varying intervals, but with some care and discretion these had caused little or no loss of time from work. The remaining quarter had had a great deal of pain or had suffered from troublesome complications, and if operation had not already been done the patient had earned it.

Incidence of Peptic Ulcer at Necropsy

Another approach to the question of incidence was made with the assistance of Dr. Donald Teare, who during 1952–3 recorded the presence of peptic ulcer and scars in coroner's necropsies. These were mainly patients who had died suddenly from either violence or natural causes. It was thought that such cases of sudden death would give a true picture of the incidence of ulcer among the general population, and the picture would not be complicated in some groups by the presence of a preceding illness which might perhaps cause or exacerbate the ulcer. The survey covered 3,223 necropsies, and the proportions in different age groups are shown in Table III. Between the two sexes the incidence of gastric ulcer is remarkably equal, but duodenal ulcer is between two and three times commoner in men, and reflects clinical experience. The incidence of gastric ulcer increases steadily with age, but duodenal ulcer generally occurs more commonly in the 45–64 group than in the over-65 group. This accords with our population study and also with clinical studies from Norway (Knutsen and Selvaag, 1947).

TABLE III.—*Necropsy Incidence*

Sex	Age	Total	Active		Scar	
			No.	%	No.	%
		Gastric Ulcer				
Male	<45	238	1	0·4	1	0·4
	45–	636	18	2·8	39	6·1
	65+	979	29	3·0	86	8·8
		1,853	48		126	
Female	<45	150	1	0·7	2	1·3
	45–	324	7	2·2	13	4·0
	65+	896	29	3·2	65	7·3
		1,370	37		80	
		Duodenal Ulcer				
Male	<45	238	5	2·1	10	4·2
	45–	636	19	3·0	40	6·3
	65+	979	16	1·6	44	4·5
		1,853	40		94	
Female	<45	150	1	0·7	2	1·3
	45–	324	2	0·6	11	3·4
	65+	896	9	1·0	16	1·8
		1,370	12		29	

This difference in trend with age would fit in with the hypothesis that duodenal ulcer has increased in incidence, but the generation over 65 have not been exposed in youth to the ulcerogenic influences to the same extent as in the younger generations.

In general, necropsy studies show that gastric and duodenal ulcers are approximately equal in incidence, although clinical practice suggests that duodenal ulcer is in appreciable excess. This may be due perhaps to gastric ulcers having a greater tendency to develop terminally with other illnesses. This factor can be excluded in those who have met a sudden death in an accident and in those who have committed suicide without a known preceding organic illness. Such cases have been analysed in this necropsy series (Table IV), and it is interesting to note that in men duodenal ulcer was twice as common as gastric ulcer.

TABLE IV.—*Violence and Suicide*

Age	No.	Ulcers and Scars			
		G.U.	D.U.	Total	%
	Males				
<45	70	—	3	3	4·3
45–	67	2	5	7	10·4
65+	56	3	2	5	8·9
	Females				
<45	31	—	—	—	—
45–	26	3	1	4	15·4
65+	43	6	2	8	18·6

Liability to Develop a Peptic Ulcer

Which members of the community are more liable than others to develop peptic ulceration? It is by studying the difference in incidence that clues may be found towards the aetiology of peptic ulcer. There are differences in the frequency of association with other diseases. There are striking differences in relation to possible environmental influences, as demonstrated by studies on geographical distribution, social class pattern, and occupation. There are also important differences relating to constitutional factors such as blood groups and gastric secretory activity. Finally, there is the significance of the anxiety factor with its interplay between environmental stress and temperament.

Hospital practice certainly suggests that chronic bronchitis and emphysema has a special tendency to be associated with peptic ulceration. This association has been noted previously by Weber and Gregg (1956) and by Latts, Cummins, and Zieve (1956), who found more than three times

TABLE V.—*Presence of Peptic Ulcers and/or Scars*

	Persons Total		Persons G.U.		Persons D.U.		Persons G.U.+D.U. and J.U.	
	Obs.	Exp.	Obs.	Exp.	Obs.	Exp.	Obs.	Exp.
Violence and suicide	27	36·7	14	19·3	13	16·7	—	0·7
Cardiovascular	231	222·8	139	137·2	89	81·0	3	4·6
Chronic bronchitis	51	35·5	27	21·8	20	12·9	4	0·8
Mental	20	24·1	17	16·2	3	7·5	—	0·4
Miscellaneous ..	134	143·9	86	88·6	46	52·8	2	2·5
	463	463 0	283	283·1	171	170·9	9	9·0

the expected number of ulcers at necropsy among those who were noted to have hypertrophic pulmonary emphysema. Further information has been collected on this point. In the coroner's necropsy survey, a higher incidence of both gastric and duodenal ulcer was found among persons in whom death was associated with bronchitis (Table V) ($\chi^2 = 10.2874$; $N=4$; $0.02<P<0.05$).

Environmental Factors

Environmental factors are associated with varying incidence of peptic ulcer, and this is considered in relation to geography, social class pattern, and occupation.

Geographical Incidence

Between different populations there appear to be striking differences in the incidence of gastric and duodenal ulcer, but our knowledge is based more on varying G.U./D.U. ratios and clinical impressions than on comparisons of absolute incidence from population surveys. In considering G.U./D.U. ratio it is of interest that only from one centre, a fishing community in North Norway, has an excess of gastric over duodenal ulcers been reported (Schanke, 1946). Elsewhere there is an excess of duodenal over gastric ulcers.

Within Great Britain there are striking differences, with a much lower G.U./D.U. ratio in Scotland than in London. Tidy (1944) found a disproportionate rise in the male mortality from duodenal ulcer in Scotland up to 1937. Striking differences in incidence of peptic ulcer have been reported in Nigeria (Konstam, 1954), in Malaya (Kouwenaar, 1930), and in India (Dogra, 1940). Dogra made a very careful clinical study of the peptic ulcer problem throughout India. He found peptic ulcer was fifteen times as common in Madras (South) as in the Punjab. Everywhere duodenal ulcer greatly exceeded the incidence of gastric ulcer, the D.U./G.U. ratio being 30:1 and the male/female ratio 18:1. In Southern India duodenal ulcer was a disease of the poor agricultural and labouring classes and affected all castes and creeds, but was rare in the upper classes.

On a brief visit to India I had the opportunity of discussing the ulcer problem with many doctors, and the geographical difference was certainly very striking between Travancore and Karachi, but peptic ulcer seemed comparatively common in Calcutta and Bombay. Duodenal ulcer in Southern India tends to stenose and not to bleed or perforate, and those working there do not think this can be explained only by inadequate transport facilities, but clearly this factor plays a part. The stenosed patients might come a hundred miles to the hospital, but not those who bleed or perforate. It seems difficult to correlate ulcer with the use of spices, but there may well be some other dietary factor.

Social Class Incidence

There are marked social-class differences in the incidence of peptic ulcer. Duodenal ulcers are evenly distributed throughout the entire population, but there is a noticeable deficiency of gastric ulcers in the professional groups and a striking excess among the labouring classes (Doll *et al.*, 1951). It is possible that these social-class differences may be one factor in producing the geographical differences in the ratio of gastric and duodenal ulcer. Between different countries, however, this social-class distribution may not be generally applicable and needs testing. It may be untrue for Southern India, where duodenal ulcer is particularly a disease of the very poor.

Occupational Incidence

From the occupational survey (Doll *et al.*, 1951) an increased incidence of duodenal ulcer was found among doctors and amongst men in responsible positions in industry, foremen, and business executives. There was also a residual group of unskilled workers with an increased incidence, but this may have been due to a sheltered employment chosen by ulcer subjects. Better diagnosis undoubtedly contributed towards the high incidence among doctors, as there was a disproportionate number with melaena only as a presenting symptom, which led to a barium-meal examination being carried out. This would, however, suggest that the figures in other groups have been underestimated rather than overestimated. No confirmation was found for the widely held belief that bus drivers were particularly prone to the disease. Agricultural workers were found to have a remarkably low incidence due to a deficiency of duodenal ulcer.

Constitutional Factors

Constitutional factors concern sex, age, blood groups, hereditary factors, and gastric secretory activity, and these reveal interesting differences in peptic ulcer incidence.

Sex Incidence

Peptic ulcer is essentially a disease of men, approximately 80% of the cases being male. During the reproductive years of life women have a relative immunity which is particularly marked during pregnancy and which seems to decline at the time of the menopause (Clark, 1953). The overall peptic ulcer population, both in-patient and out-patient, at the Central Middlesex Hospital showed that the sex ratio varies with the type of ulcer (Jones and Pollak, 1945), and it is interesting to note that the acute ulcers which were diagnosed gastroscopically after haematemesis and melaena showed an approximately equal sex ratio. From further analysis of this and other data, Avery Jones and Doll (1953) have demonstrated that the sex ratio is nearly constant for each site irrespective of age, and they also concluded that the gastric and duodenal ulcers are between one and a half times as fatal in men as in women. This is at least in part explained by a lower tendency for acute perforation to occur in women, as shown by the very high male/female ratios in studies on this complication.

Age

The incidence of peptic ulcer varies in different age groups, but this must be distinguished from the expectation of developing an ulcer. From the age of onset of the observed ulcers in the population survey and the number of man-years lived in each age group, it was possible to calculate the annual expectation of developing an ulcer; this is almost constant, and is probably at its maximum between 35 and 64, giving a rate of 3.2 ulcers per 1,000 men. The impression that ulcers occur more often in young men is due to a failure to take into account the relative size of the population at risk.

Blood Groups

A most interesting recent discovery concerning peptic ulcer has been the correlation of this disease with blood groups. The possible presence of appreciable differences in health in persons differing in such innate attributes as blood groups was predicted by Fisher (1930), but the first convincing evidence of any such difference within the ABO system was the demonstration by Aird, Bentall, and Roberts (1953) when they showed the increased suceptibility to gastric cancer of group A persons compared to those in groups O and B, the difference in incidence being 22%. This was followed by a similar survey for proved cases of peptic ulcer in which group A and B persons were found to be less liable than group O, group A having a relative liability to peptic ulceration of 72% and the liability to duodenal ulceration being less than that to gastric ulceration (Aird *et al.*, 1953). These results were confirmed by Clarke *et al.* (1955), whose figures combined with those of Aird's showed an appreciable distinction between duodenal and gastric ulcer.

The blood-group substances are mucopolysaccharides. They are distinguished from each other by their antigenic properties. There does not appear to be a specific antigenic blood-group substance for blood group O, but those who belong to group O have a mucopolysaccharide called H substance which appears to be present to a less extent in people who belong to other blood groups. These mucopoly-

saccharides are present in small quantities in red corpuscles and in much greater amounts in body tissues and fluids, and usually in the salivary and gastric secretions.

There are two possibilities: their effect may be indirect or humoral and related to genetic control of gastric acidity; or their effect may be direct and cellular and concerned with varying tissue resistance to an exogenous ulcerogenic or carcinogenic factor, with blood group A protecting against ulcerogenic factors and blood group O protecting against carcinogenic agents. Aird (1955) has suggested that a protective action like this may be more important than is suggested by the relatively small differences which are found between the different groups. It might be, for example, that all the blood-group mucopolysaccharides protect against both cancer of the stomach and peptic ulcer but that groups O and B protect more efficiently against cancer than A, and that A and B protect more effectively against ulcer than O. Important studies are at present in progress by Clarke and his co-workers on the correlation between duodenal ulcer and the presence of mucopolysaccharides in the saliva. It appears that non-secretors have a 45% greater liability to develop duodenal ulcer (Clarke *et al.*, 1956).

Hereditary Factors

Another point of interest is the tendency for peptic ulcer to run in families. There is no doubt that the prevalence of ulcer is greater among the relatives of ulcer subjects than among the general population. There have been a number of reports of excess incidence of ulcer in the near relatives of ulcer subjects compared with controls, but the difficulty has been to overcome the objection that the patient with an ulcer is more likely to be interested in searching out similar cases in his family than the patient who is suffering from some entirely different disease. Using the population survey as a control, Doll and Buch (1950) have demonstrated an excess incidence among close relatives of ulcer subjects. There is also evidence for the independent inheritance of gastric and duodenal ulcers (Doll and Kellock, 1951). Thus relatives of gastric ulcer patients tend to have gastric ulcers, and this appears to hold for the site of the ulcer in different generations as well as the same generation.

The interpretation of this hereditary pattern is still in doubt. Is it due to hereditary altered tissue resistance or susceptibility or, as suggested by Kirsner and Palmer (1952), should the attention be directed to environmental factors and "hereditary habits" rather than to hereditary tendencies? More information is certainly required about the role of hereditary habits, and studies of twins will be needed to solve this aspect of the problem.

Hypersecretion of Acid

It seems likely that hypersecretion is one of the constitutional factors related to duodenal ulcers. Hypersecretion of acid may be due either to a great amount of acid produced from the same mass of secretory cells as in a normal person subjected to the same stimulus or, alternatively, it may be due to a greater mass of secretory cells which are responding to nervous hormonal stimuli with the same intensity as in a normal stomach. Work by Kay (1953) has thrown important light on this point. By increasing the dose of histamine stimulus to the stomach and neutralizing the systemic effects with an antihistamine, he demonstrated that the volume of the gastric response increased with increasing doses up to four times the normal body-weight dose, but thereafter more histamine produced the same volume as with four body-weight doses. It is a reasonable assumption that at this dosage level the total secretory cell mass is operating and the volume of gastric juice represents the maximum secretory capacity of the stomach. With this test there is clear evidence of hypersecretion in patients with duodenal ulcer.

Hunt and Kay (1954) next demonstrated that with the same body-weight dose of histamine the same percentage response was obtained in relation to the maximum secretory capacity in both normal and duodenal ulcer subjects. Therefore there is no greater reactivity of the gastric mucosa in duodenal ulcer subjects than in normal persons, suggesting that the duodenal ulcer subject with hypersecretion has a greater secretory cell mass than the normal individual. Further confirmation of this view came from Cox (1952), who from measurement of the stomach at necropsy demonstrated that those with duodenal ulcer are particularly concentrated amongst the larger stomachs, and a correlation clearly exists with the number of parietal cells as judged by cell counts.

There may be two components to this greater secretory cell mass. It may be hereditary in the same way as an individual's limbs or trunk may vary in size, or there may be hyperplasia as the result of long-continued nervous or dietetic overstimulation.

Support for the hereditary component comes from Dr. L. Cooke, who, using basal-secretion studies, has found that the near relatives of duodenal ulcer subjects have a significantly increased incidence of hypersecretion as indicated by this test.

With gastric ulcer there is a tendency to hyposecretion, best demonstrated when ulcers associated with pyloro-duodenal stenosis are excluded (Daintree Johnson, 1955). The nocturnal fall in *p*H (unlike that in normal subjects) raises the possibility that the lower acidity is due to a greater secretion of the non-parietal alkaline component of gastric juice. Alternatively, it may reflect the greater incidence of gastritis in the body of the stomach in patients with gastric ulcer.

Anxiety and Personality

So far, various environmental and constitutional correlations with peptic ulcer have been studied but no reference has been made to the role of anxiety and personality. Here there is a close interplay between environmental stress and constitutional nervous factors determining the reaction of the individual to those stresses.

All clinicians are agreed that acute anxiety is a most significant factor in precipitating complications in peptic ulcer and that a chronic anxiety state tends to lead to intractability of the ulcer. It is not merely a question of acute anxiety, but with this there is the ability to "bottle up" an emotional tension—"worrying inwardly." It is sometimes difficult to appreciate the degree of frustration or resentment that may be hidden. In practice it is impossible to say how much of a relapse is due to nervous tension and how much to other concomitant aggravating factors, particularly physical fatigue from insomnia or over-long hours of work and increased smoking as a reaction to the stress. Fatigue is probably as important as anxiety in promoting exacerbation of ulcer symptoms, a point frequently confirmed by doctors who themselves suffer from peptic ulcer. Those who are more exposed to sustained anxiety by their work, such as doctors or those responsible for maintaining industrial output, will have a higher proportion of clinically manifest ulcers than those who lead protected, quiet lives.

Anxiety, frustration, resentment, fatigue, smoking, and irregular meals may determine whether or not an acute ulcer, initiated by other factors, will become chronic. They spell intractability, complications, and surgery. They are not the primary cause but important aggravating factors.

This recognition of the anxiety factor is not the same as postulating that peptic ulcer develops particularly in a section of the community with a particular personality pattern (Kellock, 1951). The thesis that peptic ulcers tend to develop especially in those who are oversensitive, overactive, and overconscientious rests on very insecure evidence. The anxiety factor promotes chronicity and complications, but the personality of ulcer subjects corresponds with the rest of the population.

Why has pyloro-duodenal ulcer become more prevalent in the past thirty years in this country? It is difficult to believe that life has become so much more worrying. The changing incidence of ulcer must mean that it is associated

somewhat with our mode of living. Perhaps it may prove to be correlated with the great increase in tobacco consumption.

Integration

It does not seem possible to integrate the many aetiological considerations into one neat explanation, and it is probable that peptic ulcer is the end-product of a variety of mechanisms. Furthermore, the independent behaviour of gastric and duodenal ulcer in relation to social class, occupational incidence, and hereditary and epidemiological factors does suggest that different mechanisms may be operating, although there may well be many factors common to both sites.

How can all the differences in incidence be related to the causation of peptic ulcer? First, there must be environmental factors which account for the changing incidence in this century and the varying incidence in different parts of the world. Secondly, there must be hereditary constitutional factors which help to determine the incidence and site of ulcers. These must include the secretory cell mass of the stomach and the blood groups. Some members of the community may have a special liability to duodenal ulcer by virtue of their specially generous endowment with parietal cells or because of their blood group.

From the pathological viewpoint there is less difficulty in explaining acute than in explaining chronic ulcers. Probably acute gastric lesions—small superficial ulcers—are very common and widely distributed over the stomach and duodenum, and normally heal rapidly. From the frequent presence of mucosal fragments in gastric aspirations such small lesions are known to occur (Hawksley and Cooray, 1948). Such small lesions may be part of the normal life-cycle of the epithelium or could be due to some cytotoxic factor analogous to aphthous ulcers in the mouth. It is also possible that local ischaemia from vascular spasm could cut off adequate supplies of carbon dioxide from actively secreting parietal cells, and this could lead to an intracellular necrotizing concentration of alkalis. Davis (1952) has produced experimental ulcers this way.

The real problem in peptic-ulcer pathology is, why do some ulcers become chronic? This may be due to the presence of anti-healing factors, which could be either humoral or exogenous. The healing process could be modified by adrenal overactivity from mental or physical stress or by administration of cortisone or corticotrophin. This could operate either on cellular repair mechanisms or by modifying the physical character of mucus as suggested by Hirschowitz, Streeten, Pollard, and Boldt (1955). An impaired mucous barrier might allow cytotoxic factors within the stomach more ready access to the damaged mucosa. It is quite conceivable that anti-healing factors could be present in food and might determine the striking differences in geographical distribution. Tapioca root is the staple diet in Southern India and also in Southern Nigeria, where duodenal ulcers are so prevalent. Could the appreciable amounts of hydrocyanic acid in the root act as an anti-healing factor? Another possible anti-healing influence might arise from vascular constriction. In chronic ulcers the blood supply at the base of the ulcer may become so diminished by vascular occlusion that healing is no longer possible (Key, 1950). An earlier phase might be functional vasoconstriction from tobacco smoking.

Daintree Johnson (1955) believes that stasis in the stomach could be correlated with the development of gastric ulcer. Stasis in a jejunal loop or in the duodenum might also play a part as an anti-healing factor. Possibly the volume of secretion, and especially pooling, of gastric juice may have a greater anti-healing effect than the mere level of acidity. Stasis plus hypersecretion may be a particularly potent combination. In this connexion it is interesting to recall the observation of Zollinger and Ellison (1955), who found an association between the presence of non-insulin-secreting adenoma of the pancreas and sustained hypersecretion leading to stomal ulcer. Another mechanical factor might be the force of the jet of gastric juice passing through the pylorus and impinging on the duodenal cap, and this in turn could be correlated with nervous tension reflected on gastric motor activity.

Gastric and duodenal ulcers can occur in lower animals but only rarely in the natural state. Natural selection would tend to eliminate animals prone to develop ulceration from unusual environmental factors. In man new personal habits, new foods, new drinks, new methods of cooking and food preparation, and changing feeding habits have come under the guise of civilization. The forces of natural selection have become blunted by medical science, and a disequilibrium now exists between man and his environment, and one of its manifestations is peptic ulcer.

[The second lecture, with a list of references, will appear in our next issue.]

REVIEW OF 464 CASES OF CARCINOMA OF LUNG TREATED BY RESECTION

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In his Lister lecture of 1947 Graham reported the first substantial series of cases of carcinoma of the lung treated by pneumonectomy. Since then numerous papers have recorded the results of individual surgeons or groups of surgeons in different parts of the world.

In Great Britain, Sellors, Cruickshank, and Billimoria (1947) reported a series, followed by Brock (1948), Mason (1949), Taylor and Waterhouse (1950), Price Thomas (1952), Sellors (1955), Bignall and Moon (1955), and Belcher (1956).

At the present moment surgical treatment, where possible, is generally accepted as the most satisfactory treatment for bronchial carcinoma. This involves removal of between a quarter and a half of the respiratory mechanism, and the ability of the patient to withstand the operation depends on the function of the remaining lung tissue and his cardiovascular system. In a heavy industrial and climatically severe region such as Liverpool, inflammatory and degenerative changes in the two systems, especially in the 40 to 60 age group, are likely to be more pronounced than in the districts where sedentary occupations and light industries predominate. That such changes will affect the results of surgery is only too obvious, and it is against this background that we have investigated the results of surgery in the Liverpool Region. As a regional centre, the thoracic unit undertakes most of the surgical treatment of cases in the area apart from the few that gravitate elsewhere. We have based the figures on the known incidence of the disease in this area as revealed by the Cancer Control Organization.

The basis for selection, and the operability, operative mortality, and survival rates vary from author to author, so that a true comparison of results is not readily available. To provide some measure of comparison we have